NEWEL GUIDE FOR SUPPORTING A HANDRAIL TRAVELING OVER A NEWEL

TECHNICAL FIELD

The present invention generally relates to passenger conveyors (e.g., escalators or moving walkways), and more particularly to a newel guide for supporting a handrail traveling over a newel of the passenger conveyor.

BACKGROUND ART

Escalators or moving walkways are known as representative examples of passenger conveyors, which can transport humans or articles over a relatively short distance. The escalator is a system in which step-shaped treads and handrails, which are grasped by the hands of the passengers, are automatically put in motion. In the moving walkway, plate-like treads, which are commonly referred to as "pallets," and handrails are automatically driven.

The treads on which humans or articles are carried are continuously put in motion when in operation. The handrail also makes a continuous movement over an edge of a balustrade, which flanks the tread. The endless movements of the treads and handrail should be identical in terms of their moving speed for the safety of the passenger.

An important factor that should be considered in designing these systems is to reduce the noise and vibration when in operation for enhancing the ride of the passenger. This is because the systems include a number of components, which is characterized by, for example, rolling contact movements, rotational movements or sliding contact movements.

In Fig. 1, there is shown a prior art escalator 12. As shown therein, handrail 16 is adapted to accommodate the hands of the passengers. Handrail 16 is retained on an outermost section of a guide 28, which is attached to an edge of balustrade 18, and is moved at the same speed as the steps 14. When handrail 16 moves over the guide 28, frictional resistance is normally exerted to the handrail 16. The resistance is not great in terms of magnitude in the substantial straight section of the handrail 16. However, the resistance is remarkably increased in the curved section of the handrail 16, such as newels 26 of the escalator 12, due to a tension of the handrail 16.

As shown in Fig. 2, one attempt to reduce such frictional resistance is to provide a plurality of rollers 32 to newel 26. However, due to the tension of handrail 16, which is provided to prevent a deviation of handrail 16, the rollers 32 of

newel 26 continuously receive a load in one direction.

As shown in Fig. 3, the load exerting in one direction easily damages the journal 54, which supports the shaft 58 of the roller 32, thus resulting in serious noises. Further, after a long-term service, dusts, chips (caused by wearing of the fabrics of an internal surface of the handrail), materials (e.g., particles of rubber or urethane from a driving unit of a handrail), etc., may be accumulated and then become solidified in vacant areas between rollers 32. Furthermore, such materials may enter between the shaft 58 and journal 54 so as to cause rotational problems of rollers 32, serious noises or vibrations.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide a newel guide for supporting and guiding a handrail around a newel of a passenger conveyor without using roller assemblies. The newel guide can significantly reduce the frictional resistance, noise or vibration, which may occur during operation.

The objects of the present invention can be achieved by providing a newel guide for supporting a handrail, comprising: a friction belt in a closed curved shape, which has an outer surface that comes in contact with an internal surface of the handrail; and a support means for supporting an inner surface of the friction belt to allow the friction belt to make an endless movement around the support means.

According to one aspect of the present invention, the friction belt includes an inner layer and an outer layer, which has a friction coefficient higher than that of the inner layer.

According to another aspect of the present invention, the support means comprises: a newel frame having a pair of plate members at its upper portion, wherein the plate members are separated from each other and extending in a longitudinal direction of the newel frame; an intermediate guide mounted on the pair of plate members and having a depressed surface, which contacts the inner surface of the friction belt; and a pair of joint guides mounted to the newel frame adjacent to both ends of the intermediate guide, wherein each end of the joint guides provides a support surface for supporting the endless movement of the friction belt.

According to another aspect of the present invention, a passage through which the friction belt travels is formed under the pair of plate members.

According to another aspect of the present invention, the pair of plate members has a slit formed therebetween through which the friction belt is introduced into the passage during an assembling process of the newel guide.

According to yet another aspect of the present invention, the newel frame has a pair of wings extending laterally outwardly from the newel frame and the handrail has a pair of hooks that can fit over the pair of wings.

According to even yet another aspect of the present invention, the end of the joint guide has a curved shape in terms of its cross-section.

According to still yet another aspect of the present invention, the joint guide is fixed to the newel frame by using a thread.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a perspective view of the prior art escalator;

Fig. 2 is a side elevational view of a newel of the escalator shown in Fig. 1;

Fig. 3 is a sectional view of the newel of the escalator shown in Fig. 1;

Fig. 4 is a perspective view of a newel guide for supporting and guiding a handrail in accordance with the present invention;

Fig. 5 is an exploded perspective view of the newel guide shown in Fig. 4;

Fig. 6 is a cross-sectional view of the newel guide when taken along a line 6-6' in Fig. 4;

Fig. 7 is a cross-sectional view of the newel guide when taken along a line 7-7' in Fig. 4;

Fig. 8 is a perspective view of the newel guide for the handrail of the present invention in an assembled state; and

Fig. 9 is a side sectional view of a joint guide engaged with a friction belt.

BEST MODE FOR CARRYING OUT THE INVENTION

Herein below, a preferred embodiment of the present newel guide for supporting and guiding a handrail in a passenger conveyor will be described with reference to the accompanying drawings.

In this description of the present invention, the term "newel" shall mean various sections of the passenger conveyor at which the handrail travels in a curved shape during its continuous movement (e.g., newels 26 formed near an entrance landing and an exit landing of the escalator shown in Fig. 1). The newel may include a section of the passenger conveyors adjacent to a driving pulley (not shown) for moving the handrail, in which the handrail passes by in the curved shape.

In Figs. 4 and 5, there is shown a newel guide 100 for supporting and guiding a handrail in accordance with the present invention.

Newel guide 100 includes friction belt 104, newel frame 101, intermediate

guide 102 and pair of joint guides 103.

Referring to Fig. 6, friction belt 104 is a member that moves with handrail 106 when it contacts an internal surface of handrail 106. Friction belt 104 makes an endless continuous movement. In the preferred embodiment of the present invention, friction belt 104 has an inner layer 104b and an outer layer 104a that is integrally formed with the inner layer 104b. Outer layer 104a has a friction coefficient that is great enough to make it difficult for outer layer 104a to slip on the internal surface of handrail 106. As a result, when handrail 106 moves, friction belt 104 is rotated by handrail 106 in a rolling-contact therewith. Inner layer 104b comes into a contact with a support member for supporting the endless continuous movement of friction belt 104. To achieve an easier relative movement of friction belt 104 with the support member, inner layer 104b has a low friction coefficient.

As a modification, outer layer 104a may have a low friction coefficient. In this case, the sliding-contact occurs between the internal surface of handrail 106 and outer layer 104a.

As another modification, lubricant may be used between inner layer 104b and members 102, 103d for supporting inner layer 104b, which will be described below in detail, for the relative movement of friction belt 104.

As still yet another modification, friction belt 104 may have two members, i.e., an outer member and an inner member separated from each other and respectively corresponding to the outer layer and the inner layer of the preferred embodiment. The inner member and the outer member are placed in contact with each other in a radial direction. In this case, the outer member, which is also placed in contact with the internal surface of handrail 106, has a great friction coefficient. On the other hand, the inner member, which is placed in contact with the support member for supporting the continuous movement of friction belt, has a low friction coefficient.

The function of the support member for supporting the endless continuous movement of friction belt 104 is implemented through the use of the newel frame 101, intermediate guide 102 and joint guide 103.

As shown in Fig. 7, newel frame 101 has recess 101b into which a balustrade (not shown) of a newel is fitted. Newel frame 101, whose recess 101b is fitted over an edge of the balustrade, provides a base structure for supporting friction belt 104 and handrail 106.

Newel frame 101 also has a pair of sidewalls 101f that vertically extends from an upper portion of newel frame 101, a pair of wings 101c extending laterally

outwardly from ends of sidewalls 101f, and a pair of plate members 101d extending laterally inwardly from the ends of sidewalls 101f. In this configuration, an upper portion of recess 101b, a pair of sidewalls 101f, and a pair of plate members 101d define a passage 101a through which friction belt 104 moves for its endless continuous movement.

Hooks 102a, 103b, 106a of intermediate guide 102, joint guide 103 and handrail 106 are maintained around the pair of wings 101c to prevent a deviation of those components 102, 103, 106, especially handrail 106, from newel frame 101. Since the deviation of handrail 106 from newel frame is prevented by fitting hooks 106a formed at both ends of handrail 106 over wings 101c of newel frame 101 (as described above), there is no need for the tension of handrail 106 to be exceedingly high for the purpose of preventing the deviation of handrail 106.

As shown in Fig. 7, formed between a pair of plate members 101d is a slit 101e through which friction belt 104 is introduced into passage 101a in an assembling process of newel guide 100. A lower surface of plate member 101d has a low friction coefficient since it may be contacted with the inner layer 104b of friction belt 104. In the preferred embodiment of the present invention, an upper surface of plate member 101d is placed in flush with an upper surface of wing 101c. However, they may have a different level from each other.

Intermediate guide 102 is mounted on the upper surfaces of wing 101c and plate members 101d. Intermediate guide 102 has the pair of hooks 102a formed at both ends thereof, which are in the shape of wrapping wings 101c. Intermediate guide 102 has a depressed surface 102b formed at a center of an upper surface of intermediate guide 102, which comes into a contact with inner layer 104b of friction belt 104. The depth of depressed surface 102b is determined such that only a contact between the outer layer 104a of friction belt 104 and the internal surface of handrail 106 is allowed when handrail 106 is completely mounted on the outer layer 104a of friction belt 104 positioned in the depressed surface 102b. Meanwhile, upper surfaces of the remaining portions of intermediate guide 102 except the depressed surface 102b directly face the internal surface of handrail 106 and may be contacted therewith. Therefore, it is desirable for the upper surfaces of intermediate guide 102 including the depressed surface 102b to have a low friction coefficient considering the contact with the internal surface of handrail 106 or the contact with the inner layer 104b of friction belt 104.

Joint guide 103 is mounted on newel frame 101 adjacent to an end of intermediate guide 102. Since the tension of friction belt 104 becomes different

depending on the position of joint guide 103, the joint guide 103 should be positioned on newel guide 101 such that the tension of friction belt 104 is proper for the endless continuous movement.

As shown in Fig. 6, the joint guide 103 is provided with the pair of hooks 103b formed at both ends of joint guide 103, while protuberance 103c is protruded downwardly from a center of joint guide 103 and upper surface 103d is contacted with the inner layer 104b of friction belt 104. A lower surface of protuberance 103c is also contacted to the inner layer 104b of friction belt 104.

As shown in Fig. 9, similar to the upper surface 103d and the lower surface of protuberance 103c, one end 103a of joint guide 103 is also contacted with the friction belt 104 at one end of the friction belt 104 at which an advancement direction of friction belt 104 is changed. It is preferable that the end 103a of the joint guide 103 has a curved shape in terms of its cross-section. The end 103a of joint guide 103 has a low friction coefficient in order to reduce the friction with the frictional belt 104.

As shown in Fig. 5, the joint guide 103 is directly fixed to the newel frame 101 by using a thread 105. As a modification, the joint guide 103 may be fixed to the newel frame 101 with one end of intermediate guide 102 being disposed or sandwiched therebetween.

The operations of the newel guide 100 of the present invention for supporting and guiding the handrail 106 constructed in the above manner will be described herein below.

In the completely assembled state, the friction belt 104 is supported at both ends by a pair of joint guides 103 such that it can travel through a passageway provided by passage 101a and depressed surface 102b, thus making the endless continuous movement.

When the handrail 106 is moved by a driving pulley (not shown), the friction belt 104, which is placed in contact with the internal surface of handrail 106, moves with the handrail 106 due to the high friction coefficient. At the same time, the inner layer 104b of friction belt 104 slides smoothly on the depressed surface 102b of intermediate guide 102 and upper surface 103d of joint guide 103. Friction belt 104 and handrail 106 starts to be separated on upper surface 103d of joint guide 103 during its movement. Thereafter, the friction belt 104 advances toward the other joint guide 103 after passing by the end 103a of joint guide 103 and then the lower surface of protuberance 103c, thereby making the endless continuous movement. At this time, due to the inner layer 104b of friction belt 104 and the portions

contacted with the inner layer 104b, e.g., the end 103a of joint guide 103, the upper surface 103d of joint guide 103, the lower surface of protuberance 103c, the depressed surface 102b of intermediate guide 102 and plate members 101d, have a lower friction coefficient and the sliding-contact between them does not cause a high level of resistance against the advancement of friction belt 104, thus resulting in a silent advancement of friction belt 104.

INDUSTRIAL APPLICABILITY

In accordance with the newel guide of the present invention for supporting and guiding the handrail traveling over the newel, since there is no need for the high level of tension to be applied to the handrail for the purpose of preventing a deviation of the handrail, the resistance against the advancement of the handrail can be reduced. Therefore, a driving unit for moving the handrail having a smaller capacity can be used.

The newel guide may provide an enhanced ride compared to the prior art newel guide using rollers since it has a reduced noise and vibration during operation.

Further, the newel guide has an increased service life since it does not have the problems of the prior art newel guide related to the rollers and the peripherals.